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THE HISTORY OF CHINESE SPRING WHEAT*

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Summary

Chinese Spring, which is the standard cultivar for wheat cytogenetic research, came to the Plant Breeding Institute at about the turn of this century. There it was known as Chinese White. W.O. Backhouse, a former student of Director Biffen's, took it to Argentina and in 1916 discovered its easy crossability with rye. It entered the United States in 1924, when L.R. Waldron of North Dakota received it from Biffen, and by 1932 it had made its way via Saskatoon, Canada, to Columbia, Missouri, where it was now called Chinese Spring. Because of its crossability with rye, Sears in 1936 used it for making wheat-rye hybrids for use in a chromosome-doubling experiment and obtained among the hybrids two wheat haploids, one of which he pollinated by wheat. The several offspring had a number of monosomes and trisomes, which became the nucleus of the extensive series of aneuploids now available in the cultivar Chinese Spring.

Index words: Chinese White, Szechuan, crossability, haploid, aneuploids.

Chinese Spring wheat is generally accepted as the standard cultivar for cytogenetic research with wheat, since it is the cultivar in which almost all of the more than 250 aneuploids now available were isolated. Agronomically, however, Chinese Spring has some serious faults, such as easy shattering, susceptibility to almost all wheat diseases and insects, and poor adaptation to the world's major wheat-growing regions; and many people have asked why it was chosen to be the standard cytogenetic cultivar. Others, particularly wheat scientists from China, have wondered whether Chinese Spring actually came from China and, if so, from which region it came and whether it is still cultivated there.

The answer to why it was chosen as the cultivar in which to produce monosomes, trisomes, tetrasomes, and almost all of the other aneuploids that are available today is simple: It was not chosen; it came into cytogenetic use by accident. Sears (unpublished) made hybrids between wheat and rye in 1936 in attempts to induce chromosome doubling by heat shocks. Chinese Spring was the wheat used, since it was known to cross readily with rye (Backhouse, 1916). Among the wheat-rye hybrids Sears obtained were two wheat haploids, and one of these was pollinated by euploid Chinese Spring, primarily to see whether or not it would set seed. Thirteen viable seeds were obtained, which when grown were found to have a number of monosomes, trisomes, and reciprocal translocations (Sears, 1939). Nullisomes were eventually obtained from the monosomes and one nullisomic proved to be 3B, which is partially asynaptic and was therefore a good source of additional monosomes and trisomes (Sears, 1944). Since there was no compelling reason

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to change to a different cultivar, all subsequent aneuploids were produced in Chinese Spring, which, although less than ideal for commercial use, does have certain advantages for cytogenetic work. Its awnlessness makes crossing easy, its tendency to shatter makes threshing easy, it is productive when grown under favorable conditions, and its susceptibility to diseases avoids complications when locating genes for resistance to other cultivars.

There seems to be little doubt that Chinese Spring came to the western world from the Szechuan province of China. British representatives in foreign countries used to be encouraged to collect plants that would be of possible value in their homeland and to bring or send them back to England. Thus it was that Sir Roland Biffen, then Director of the Plant Breeding Institute at the University of Cambridge, received from Szechuan, at about the beginning of this century, a wheat which he called Chinese White. This wheat was at that time of interest because it was early maturing, set a high number seeds per spikelet and was tolerant to drought (Biffen, 1922; Biffen and Engledow, 1926). It was next mentioned by W.O. Backhouse, a former student at Cambridge who had gone to Argentina as a wheat breeder, taking with him several PBI wheats, including Chinese White. He (1916) tested various wheats for crossability with rye and found Chinese White to be far superior to all the others.

In North America, Chinese White first appeared in North Dakota, where the pioneering wheat breeder L.R. Waldron obtained it from Biffen in 1924. Waldron shared it with other breeders, one of whom passed it on to J.B. Harrington at Saskatoon, Canada. Records at the University of Missouri show that a sample of wheat called Chinese Spring was received from Saskatoon in 1932. It was known at Missouri to be highly crossable with rye and had almost certainly been acquired by L.J. Stadler or one of his students for that reason. By that time Stadler had developed a strong interest in polyploidy and needed materials from which amphiploids might easily be produced.

It seems clear that the Chinese Spring which Sears used in his crosses with rye was the same as Biffen's Chinese White. (Because the cultivar has one of wheat's three genes for red seeds, it is not fully white; thus Chinese White is something of a misnomer. Who changed the name to Chinese Spring is not known).

Biffen's Chinese White is still maintained in the PBI collection and is indistinguishable from Chinese Spring. Two-dimensional electrophoresis has shown that their storage proteins are identical, and their electrophoretic banding patterns have also been shown to be identical for the following isozymes; acid phosphatase, α-amylase, β-amylase, esterase, glucosephosphate isomerase and superoxide dismutase.

The second question, where in Szechuan did Chinese White come from and is it still grown there, is less easily answered. Presumably the collector did not provide the name of the exact locality from which the cultivar came, for Biffen did not record it. However, Mr. Yuchun Zou, who came to Oregon State University from Szechuan to study with Dr. Warren Kronstad, had noticed a strong resemblance of Chinese Spring to certain Szechuan cultivars. One in particular he found to be practically indistinguishable from Chinese Spring, but when he pollinated it with

rye, it proved to be of low crossability (personal communication). Possibly, perhaps in a different locality, a type which not only looks like Chinese Spring but also behaves like it in crossability with rye will be found. It may be that the particular cultivar from which the original selection was made was heterogeneous for crossability with rye and that the collector just happened to sample a population with a high frequency of the crossability alleles at the loci concerned, of which there are two (Backhouse, 1916).

If a thorough sampling of Szechuan cultivars resembling Chinese Spring fails to turn up an exact duplicate, this may be an instance of a particular biotype being crowded out in its original area of cultivation but maintained elsewhere, not for its agronomic desirability, but for an unrelated physiological characteristic.

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